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na edulis Ker), sweet potato (*Ipomoea batatas* Poir.), taro (*Colocasia esculenta* Schott), *Curcuma* species, Goa bean (*Psophocarpus tetragonolobus* DC.), bitter cucumber (*Momordica charantia* L.), snake gourd (*Trichosanthes anguina* L.), Lima bean (large) (*Phaseolus lunatus* L.), Goa potato (*Dioscorea aculeata* L.), wild yam (*Dioscorea hispida* Dennst.), and sweet yam (*Dioscorea alata* L.). The middle story contains taller-growing plants, such as cassava (*Manihot utilissima* Pohl), citrus varieties such as *Citrus nobilis* Lour. and *Citrus aurantifolia* Swingle, papaya (*Carica papaya* L.), banana (*Musa* species), rose apple (*Eugenia aquea* Burm.), and soursop (*Anona muricata* L.). The upper story is formed by tall fruit trees, such as coconut (*Cocos nucifera* L.), jackfruit (*Artocarpus integra* Merr.), sapodilla or chico (*Achras zapota* L.), pomelo (*Citrus maxima* Merr.), of which numerous forms, differing in size and color, are known in the Indies, *belinju* (*Gnetum gnemon* L.), mango (*Mangifera indica* L.), durian (*Durio zibethinus* Murr.), candlenut tree (*Aleurites moluccana* Willd.), tamarind (*Tamarindus indica* L.), *pete* (*Parkia speciosa* Hassk.), stinkbean tree (*Pithecellobium lobatum* Benth.), and *santol* (*Sandoricum koetjape* Merr.).

This list does not by any means include all the plants that appear in the gardens. The plants vary in number and type from region to region in accordance with differences in soil, climate (elevation), and the taste of the owners.

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Estimates indicate that about 15 per cent of the cultivated land in Java and Madura is taken up by gardens. Unfortunately, there have been no detailed studies of garden culture outside of Java, although the products of the garden play an important role in the diet of all the peoples of Southeastern Asia. Terra, who compared garden culture in various districts of Java, found that the share of land allotted to gardens, together with the intensity of their cultivation, increases as the total amount of crop land per head decreases, down to the point where the average amount of crop land per head is only 0.15 hectare. Where the amount of land is even less than this the share of garden land decreases, although there is a tendency at first to increase the intensity of the garden culture. Close to the larger cities, the amount of crop land per person, together with the amount devoted to gardens and the intensity of the latter's cultivation, falls off to a minimum since the population here has supplementary sources of income.

With the development of a money economy appears a specialization that is directed toward the urban centers. There has always been some natural specialization inasmuch as some plants do not grow well everywhere. The coconut, for example, does best in the lowlands. But the new specialization depends not only upon such natural factors as soil and climate, but also upon economic factors such as marketing facilities and the development of communications. This specialization can be observed generally in Southeastern Asia.

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Ochse and Terra found that in calories of food value the returns of the gardens proved to be slightly higher per hectare than those of the irri-

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gated fields. One of the great advantages of garden culture over field culture is that there is always something ready to harvest from the former and therefore something to sell when money for daily household needs becomes scarce. Another advantage is that the garden supplies the family with a great variety of side dishes rich in vitamins; the vegetable proteins of the garden produce are also of high value.

As to the possibilities of improving garden culture, these two authors state:

> It is very evident that an improvement of the compound horticulture is a very difficult problem through the highly varied and dense planting of these compounds as a result of which they come to resemble a very complicated symbiosis. But for all this it must be possible by systematic investigation to improve not only the quality but also the quantity of the production. It may be said that the compounds with their story or layer formation superficially considered will find no favour in the eyes of western agriculture, but they are an essential link in the native production apparatus.[3]

The alarming decline in the welfare of the people of Java in the face of a mounting population prompted Netherlands Indies officials to examine every possibility of improving the peasants' condition. This accounts for the studies of Ochse and Terra. Lacking detailed studies outside Java, we are obliged to depend upon scattered references of uneven value.

Credner states that in Thailand practically every house has a few trees on the lot, and the villages are often hidden by tree clusters. The greatest intensification of garden culture is found on the right bank of the Mae Nam Chao Phraya (the Menam) in Bangkok Noi, just opposite Bangkok. Here irrigation is employed in garden culture, a technique not usually found in Southeastern Asia. The gardens are surrounded by walls 1 meter high and are traversed by trenches 2 meters apart. The beds between the trenches are elevated. The trenches work both as drains and as irrigation ditches. Small sluices control the water. In the gardens there is a great variety of fruit trees and palms which climbers, such as *Piper betle* L., use as supports. In the trenches the peasants grow lotus and water chestnut (*Trapa natans* L.).[4] Zimmerman, in his survey of rural Thailand, points out that in most regions the peasants rely too much on one crop, rice, and he recommends in several instances improvements in the cultivation of the home lots so that families may have a better supply of fruits and, above all, of vegetables. In the Khlong Rangsit section he observed that "on account of the lack of homestead and village sites among the people there is no gardening and home production of food."[5] This observation may be applied to Southeastern Asia in general. Wherever the dominant form of land tenure is tenancy the flimsy shack of the tenant has no mixed fruit and vegetable garden around it, for his status is much too uncertain. A tenant

[3] Ochse and Terra: *op. cit.*, pp. 371–372.
[4] Credner: Siam, 1935, p. 246.
[5] Zimmerman: Siam, 1931, p. 307.

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ing crops. The process can be adapted to climate by manufacture either in shallow pits or low heaps."[64]

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Dry-Field Crops Cultivated by Peasants

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The list of dry-field crops cultivated in Southeastern Asia is rather large, but there are regional variations. Cassava, for example, is commonly grown on tegalans in Java (2,300,000 acres), whereas it is unimportant in Sumatra, Borneo, the Philippines (40,000 acres), Malaya (24,000 acres), and Indochina (75,000 acres). The most important dry-field crops are upland rice, maize, cassava, sweet potatoes, peanuts, soy beans and other pulses, tobacco, and sugar cane, all of which are annuals. Of the first four, only upland rice is a native of Southeastern Asia, whereas the other three are natives of the New World and were introduced into Southeastern Asia by the Spaniards in the sixteenth century.

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TABLE IV—CHEMICAL COMPOSITION OF CASSAVA AND IMPORTANT CEREAL FLOURS

	CASSAVA (PER CENT)	MAIZE (PER CENT)	WHEAT (PER CENT)	RICE (PER CENT)
Moisture	10.75	13.41	13.65	13.12
Protein	0.87	7.56	12.35	9.85
Crude fat	1.19	3.79	1.75	0.88
Ash	1.24	1.78	1.81	1.51
Crude fiber	6.12	3.19	2.53	0.63
Carbohydrates	79.83	71.27	67.91	74.01

Source: The Cassava Industry in the Philippines, 1939, p. 7.

The inhabitants of Southeastern Asia have long relied upon root crops, fruits, leaves of various plants, and wild roots and tubers gathered in the forests, as well as upon rice. Scheltema refers to a number of early statements which indicate that "rice was not yet the principal food for a large portion of the native population [of Java] as late as the first part of the 19th century and that the rice diet has become much more important in the course of the past hundred years" as a result of the great extension of the cultivation of irrigated rice fields.[65] If it is correct that the rice consumption per capita increased during the past century, the opposite trend has been evident during the present century. For a while the increase in the area of irrigated land was great enough to allow for a larger rice production, but with the steadily increasing pressure of population the peasants now have to depend more and more upon unirrigated land. Thus the production of dry-field crops is gaining in importance.

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Authorities in Southeastern Asia have been especially worried over the increase of cassava production and consumption. Because of the exhaustion of the soil fertility on many dry fields, the growing of upland rice and

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[64] Worthington: Science in Africa, 1938, p. 387.
[65] Scheltema: The Food Consumption, 1936, p. 10.

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maize has become unprofitable, and many peasants have changed over to cassava, which makes lesser demands upon soil fertility. The per acre yields of cassava are high, and the plant is a source of carbohydrates, fat, and protein. From the standpoint of dietary needs, however, the ratio between carbohydrates on the one hand and protein and fat on the other is unfavorable. People who live on cassava merely fill their stomachs. The insufficiency of protein intake is detrimental to their health. Table IV[1] compares the chemical composition of cassava, maize, wheat, and rice.

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Maize, as the table indicates, compares quite favorably in protein content with wheat and rice and is especially rich in fat. It has gained an important position in the diet of the people of central and eastern Java, Madura, the island of Cebu, and the Cagayan Valley in the island of Luzon. Both maize and cassava are easy to store and therefore have a great advantage over sweet potatoes, which must be consumed soon after they ripen.

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In Thailand maize is an important crop on the Khorat plateau and in other regions where dry land is available. Among the root crops cassava has gained a greater importance than taro and yams. The last two are grown mainly by Chinese gardeners in the neighborhood of large towns. Cassava, too, is grown commercially by Chinese, especially near the railroad on the peninsula.

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Most of the so-called dry-field crops are grown in Indochina during the dry season on land that is flooded during the rainy season and at that time produces rice. Gourou has estimated that in Tongking 100,000 hectares of land are used exclusively for the production of dry-field crops and that 350,000 hectares of irrigated land are occupied by such crops during the dry season.[66]

This practice of growing dry-field crops on irrigated land during the dry season is especially widespread in Java, where population pressure is so great that the peasants have to use every possible means to enlarge their food supply. If there is not enough water available to grow a second wet-rice crop, they will always try to get a second harvest of quick-growing dry-field crops during the dry season.

In contrast to the peoples of Java, the Filipinos do not, as a rule, go in for the raising of dry-field crops on wet riceland during the dry season, although this should be possible if the land were cultivated. There is enough water in the soil a short distance below the surface for the growing of crops practically everywhere during the dry season. Repeated tilling would keep the soil soft and fine so that water could move upward by capillary action to replace that which is lost through evaporation. Cultivation would enable plants such as maize, peanuts, and soy beans to grow on land that otherwise would be baked dry and hard. Although the ratio between cultivated land and population in the Philippines does not make a dry-season crop a necessity in most regions, there are a number of districts where the peasants traditionally raise a dry-season crop on irrigated

[66] Gourou: Les paysans, 1936, pp. 407–408.

1 [see page 75 cat 116 -- Analyst]

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

Pestiferous slums compel attention in the larger towns, but conditions may be worse in the smaller towns up-country where they escape notice; even the villages often suffer from congestion. Food is less abundant, because cultivation for export reduces the area under subsistence crops, and the greater pressure on this smaller area diminishes the outturn; the demands of western enterprise for labour have a similar effect. Often the people take to cheaper or to more palatable but less nutritious food; thus groundnut oil replaces sesamum oil, cassava replaces rice, polished rice spreads beri-beri; sometimes the food is adulterated with imported products as when for some years large quantities of mineral oil were imported into Burma to mix with native vegetable oils. The natural effect of the economic forces released in the course of development is to lower the standard of health.[1]

Again, with man, as with crops and cattle, there is an intimate link between material development and infection. The improvement of communications and the mass migration of labourers spread old diseases and bring in new diseases. In Africa 'diseases have been introduced to which the African was formerly a stranger, and fresh strains of parasites cause attacks to which he was formerly immune; further, Africans now contract diseases common to temperate zones, and it is possible that the intensity of these is increased owing to the lack of acquired immunity'. The spread of sleeping sickness 'must in many cases be associated with the opening of new communications and the development of trading facilities'. The conditions under which labour is employed foster venereal disease, which in modern Africa seems to have an incidence ranging from 50 to 90 %.[2]

For various reasons also native medical skill deteriorates. The patronage of native rulers encourages the most successful physicians, and helps to maintain traditions, in Burma reminiscent of the Hippocratic oath, that make for professional self-respect. Under western rule the native doctors lose their best and most remunerative clients. Moreover the herbs, formerly gathered in the fields, come to be purchased in the market, and are liable to adulteration, so that the practitioner no longer knows what he prescribes. This applies also to modern substitutes for native drugs, such as cheap brands of quinine tabloids which, if they contain any quinine, are of little use except as marbles owing to the thickness of the coating; prac-

[1] *ISC*, I, 21; Mills, p. 321; *RAB*, 1915–16, p. 30; 1918–19, p. 41.
[2] *African Survey*, pp. 1129, 1144–6, 1199.

7: Furnivall G-4, 5 (no date) 1948 AL1 Southeast Asia AL1

economic development tends to spread disease and foster ill-health; the more enlightened employers recognize the need for measures to improve the health of their labourers, and support the Government in taking steps to enforce similar measures on other employers; and attempts to raise the standard of health on western enterprise bring to light the need to raise the standard of health among the great mass of the people.

One aspect of this problem is nutrition. It is now recognized that in lands developed by native enterprise, cultivation for export tends to grow at the expense of cultivation for food, and it seems that during recent years, even where food grains constitute the staple export, less has been available for local consumption.[1] Moreover, the expansion of cultivation deprives the people of spontaneous products of the waste, formerly used to supplement their diet. Naturally problems of nutrition engage most attention where the profits of western enterprise are closely linked with the supply of food. We have noticed that in Malaya the loss to the Government and employers occasioned by the shortage of rice after the war of 1914 led to renewed insistence on the compulsory cultivation of rice. Especially in Africa the inefficiency of native labour is regarded as largely due to inadequate or unsuitable diet, and so 'nutritional problems are now much in the minds of administrations: whether the African eats enough food and, if he does, whether it is the right kind, and whether the attack on nutrition may not be the most important factor in reducing disease'. In the past Africans have adopted new kinds of food, but whether they will be so willing to accept the advice of dieticians would seem doubtful. In Malaya where the polished rice that has recently gained favour is regarded as a cause of beri-beri, attempts to induce the people to revert to roughly husked rice appear to have had little more success than the propaganda for standard bread in England, and it is unlikely that the African will be more responsive. It is unlikely also that the African will be able to afford more nutritious food, if it is more costly; normally, as we have noticed, in the process of economic development, cheap food drives out good food. Moreover, dietetics is a new science, and 'some African tribes seem to maintain physical fitness on food which is, according to nutritionists, wanting in certain constituents essential to health'.[2] Caution would seem necessary, therefore, in introducing innovations, and in any case no one can force the people to eat proper food.

[1] Wickizer and Bennett, p. 188. [2] *African Survey*, pp. 1122, 1194.